Claims

[c1] A gap collar for an electromagnetic communication unit of a downhole tool positioned in a wellbore, the downhole tool communicating with a surface unit via an electromagnetic field generated by the electromagnetic communication unit, the gap collar comprising:
a first collar having a first end connector;
a second collar having a second end connector matingly connectable to the first end connector;
a non-conductive insulation coating disposed on one of the first end connector, the second end connector and combinations thereof, the insulation coating adapted to electrically insulate the first and second end connectors; and
a non-conductive insulation molding positioned about one of an inner surface of the collars, an outer surface of the collars and combinations thereof, the insulation moldingly conforming to the shape thereof.

[c2] The gap collar of claim 1 further comprising a non-conductive protective molding positioned about the outer surface of the collars.

[c3] The gap collar of claim 2 wherein the protective coating

is plastic.

[c4] The gap collar of claim 2 further comprising a wear band positioned about at least a portion of the protective coating.

[c5] The gap collar of claim 4 wherein the wear band is metal.

[c6] The gap collar of claim 1 further comprising a metal ring positioned between a shoulder portion of the collars and in contact therewith.

[c7] The gap collar of claim 6 wherein at least one cavity is present between the bearing and collars, the gap collar further comprising an epoxy positioned in the at least one cavity.

[c8] The gap collar of claim 1 further comprising a non-conductive sleeve positioned along an inner surface of the collars.

[c9] The gap collar of claim 8 wherein the non-conductive sleeve is plastic.

[c10] The gap collar of claim 1 further comprising a wear band positioned about the outer surface of at least a portion of at least one of the collars.

[c11] The gap collar of claim 10 wherein the wear band is

metal.

[c12] The gap collar of claim 1 wherein the connectors of the collars are mated threads.

[c13] The gap collar of claim 12 wherein the mated threads are standard threads.

[c14] The gap collar of claim 12 wherein at least one of the mated threads is modified to receive the insulation coating.

[c15] he gap collar of claim 1 wherein the downhole tool is one of a drilling tool, a coiled tubing tool, a wireline tool, a slickline tool and combinations thereof.

[c16] The gap collar of claim 1 wherein the downhole tool is a drilling tool is operatively connected to a drill string and has a passage therethrough and a mandrel therein, and wherein the collars are drill collars operatively connectable to the drill string.

[c17] The gap collar of claim 16 wherein the non-conductive insulation molding is positioned about one of the mandrel, the inner surface of the drill collars, the outer surface of the drill collars and combinations thereof.

[c18] The gap collar of claim 1 wherein the insulation coating is a ceramic.

[c19] The gap collar of claim 1 wherein the insulation molding is rubber.

[c20] The gap collar of claim 1 wherein the insulation molding forms a hydraulic seal.

[c21] The gap collar of claim 1 wherein the collars with insulation coating therebetween define a capacitive element.

[c22] A downhole electromagnetic telemetry unit for communication with a surface electromagnetic communication unit, the downhole electromagnetic telemetry unit disposed in a downhole tool positioned in a wellbore, the downhole electromagnetic telemetry unit comprising:
a gap collar comprising a first conductive collar, a second conductive collar and a non-conductive insulation coating therebetween;
electromagnetic circuitry operatively connected to each conductive collar whereby an electromagnetic field is generated and modulated; and
a non-conductive insulation molding positioned about one of an inner surface of the collars, an outer surface of the collars and combinations thereof, the insulation moldingly conforming to the shape thereof.

[c23] The downhole electromagnetic unit of claim 22 wherein the first collar has a first end connector and the second

collar has a second end connector matingly connected to the first end connector.

[c24] The downhole electromagnetic unit of claim 23 wherein the end connectors each have threads matingly connectable together.

[c25] he downhole electromagnetic unit of claim 22 wherein the electromagnetic circuitry comprises a processor and a transceiver.

[c26] The downhole electromagnetic unit of claim 22 further comprising a memory storage unit.

[c27] The downhole electromagnetic unit of claim 22 further comprising at least one sensor adapted to measure downhole parameters.

[c28] A method of generating an electromagnetic field from a downhole tool positioned in a wellbore, the downhole tool having electronic circuitry adapted to communicate with a surface unit via the electromagnetic field, the method comprising:
providing the downhole tool with a gap collar to house the electromagnetic circuitry, the gap collar comprising a first and a second conductive collar matingly connected together with a non-conductive insulation coating therebetween to form a capacitive element;

moldingly conforming a non-conductive insulation molding about one of an inner surface of the collars, an outer surface of the collars and combinations thereof such that the insulatinve molding conforms to the shape thereof; and

applying the electromagnetic field across the gap collar.

[c29] The method of claim 28 wherein the first and second conductive collars have mated connectors and wherein the non-conductive insulation coating is disposed on at least one of the mated connectors.

[c30] The method of claim 29 wherein the mated connectors have mated threads.

[c31] The method of claim 30 further comprising modifying the mated threads of at least one of the mated connectors from a standard dimension to a modified dimension.

[c32] The method of claim 28 further comprising torquing the first and second conductive collars together to form a secure connection without breaking the non-conductive insulation coating therebetween.

[c33] The method of claim 28 wherein the gap collar has a passage therethrough and a mandrel therein, the step of moldingly conforming comprising moldingly conforming a non-conductive insulation molding about one of an in-

ner surface of the collars, an outer surface of the collars, an outer surface of the mandrel and combinations thereof such that the insulatinve molding conforms to the shape thereof.

[c34] The method of claim 28 further comprising positioning a non-conductive protective coating on an outer surface of one of the collars, the insulation molding and combinations thereof.

[c35] The method of claim 28 further comprising positioning a non-conductive sleeve along the inner surface of the collars.

[c36] The method of claim 28 further comprising positioning a metal ring between a shoulder portion of the collars and in contact therewith.

[c37] A method of providing downhole information to a surface unit, the wellbore formed by advancing a drilling tool into the earth, the method comprising:
positioning a downhole evaluation tool in the wellbore, the downhole evaluation tool having an electromagnetic telemetry system adapted to communicate via an electromagnetic field with the surface unit;
measuring downhole data using sensors positioned in the downhole tool;

storing the downhole data in a memory unit positioned in the downhole tool; and
transmitting at least a portion of the downhole data to the surface via the electromagnetic field.

[c38] The method of claim 37 wherein the downhole tool is one of a wireline tool, a slickline tool, a coiled tubing tool and combinations thereof.

[c39] The method of claim 37 wherein the electromagnetic telemetry system comprises a pair of collars matingly connected with a non-conductive insulation coating therebetween.

[c40] The method of claim 39 wherein the collars have connectors with mated threads, the method further comprising modifying the threads of at least one of the collars for receipt of the non-conductive insulation coating.

[c41] The method of claim 39 wherein the electromagnetic telemetry system further comprises a non-conductive insulation molding positioned about one of an inner surface of the collars, an outer surface of the collars and combinations thereof, the insulation moldingly conforming to the shape thereof.

[c42] The method of claim 37 further comprising processing the downhole data to determine a course of action.

[c43] The method of claim 37 further comprising transmitting commands from the surface unit to the downhole unit for execution thereof.

[c44] A gap collar for an electromagnetic communication unit of a downhole tool positioned in a wellbore, the downhole tool communicating with a surface unit via an electromagnetic field generated by the electromagnetic communication unit, the gap collar comprising:
a first collar having a first threaded end connector;
a second collar having a second threaded end connector matingly connectable to the first threaded end connector;
a non-conductive insulation coating disposed on one of the first threaded end connector, the second threaded end connector and combinations thereof, the insulation coating adapted to electrically insulate the first and second threaded end connectors; and
a non-conductive insulation molding positioned about one of an inner surface of the collars, an outer surface of the collars and combinations thereof
wherein one of the first threaded end connector, the second threaded end connector and combinations thereof are modified from a standard threaded end connector to receive the non-conductive insulation coating whereby the contact area between the threaded connec-

tors is increased.

[c45] The gap collar of claim 44 wherein the insulation moldingly conforms to the shape thereof.

[c46] The gap collar of claim 44 further comprising a metal ring positioned between a shoulder portion of the drill collars to establish contact therebetween.